

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2004/014365

International filing date (day/month/year)
16.12.2004

Priority date (day/month/year)
16.12.2003

International Patent Classification (IPC) or both national classification and IPC
G01C15/00

Applicant
TRIMBLE JENA GMBH

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/014365

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/014365

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application,

☒ claims Nos. 28-58

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

☒ no international search report has been established for the whole application or for said claims Nos. 28-58

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☒ See separate sheet for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/EP2004/014365

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☒ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1-27

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-26
	No: Claims	27
Inventive step (IS)	Yes: Claims	1-26
	No: Claims	27
Industrial applicability (IA)	Yes: Claims	1-27
	No: Claims	

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/EP2004/014365

Section III

In accordance with Rule 66.1 (e) PCT, claims relating to inventions in respect of which no international search report has been established will not be the subject of an International Preliminary Examination (see also the PCT Preliminary Examination Guidelines 3.17).

Section IV.2

1. Reference is made to the following document:

D1: Y. D. HUANG: "Calibration of the Wild P32 Camera using the Camera-ON-Theodolite method" PHOTOGRAMMETRIC RECORD, vol. 16, no. 91, April 1998, pages 97-104, XP009044993 (cf. the application, pages 3 and 49).

2. The independent claims 1, 2, 20, 23, 24 and 27 to 30 are not so linked as to form a single general inventive concept (Rule 13.1 PCT) because the common features of these claims corresponding to the technical relationship between the inventions concerned (cf. Rule 13.2 PCT and the PCT 10.01), i.e. a surveying instrument comprising
- a base element and
 - a camera with an image sensor, the camera being rotatable about a vertical axis fixed with respect to said base element and being rotatable about a tilting axis, the tilting axis being rotated about the vertical axis with rotation of the camera about the vertical axis,
- are known, see e.g. the document D1.
3. The separate inventions have been grouped like the following:

Claims 1 to 27: calibrating a surveying instrument having a camera with an image sensor, the camera being rotatable about a vertical and a tilting axis, using calibration

point distance data, calibration images captured in different faces and associated data and taking into account an optical property of the camera.

Claim 28: a surveying instrument having a camera with an image sensor, and a display for displaying images and a mark indicating a sighting axis defined by the projection center and the intersection point of the tilting axis and the vertical axis.

Claims 29 and 30: calculating a direction from the coordinate system of a surveying instrument having a camera rotatable about a vertical and a tilting axis to an object point by using a direction obtained with a camera model and a transformation model and the distance of the object point to the instrument coordinate system.

Section V.2

2. The independent claims 1 and 2 are considered to be new and inventive within the meaning of Articles 33(2) and 33(3) PCT for the following reasons:
 - 2.1. The document D1, which is cited in the International Search Report and mentioned in the description on pages 3 and 49, is considered to represent the closest prior art as regards claims 1 and 2.

This document discloses a method suitable for calibrating a surveying instrument comprising a base element and a camera rigidly mounted on the telescope of a theodolite (see 'Introduction' and figure 1). Images of calibration points are generated at different positions on the image sensor, and for each of the calibration points (cf. figure 2) the distance between the respective calibration point and the surveying instrument and for each said image the position of the calibration point mapped on the image sensor is stored, as well as the tilting and the vertical angles (see e.g. the paragraph bridging pages 100 and 101).

With this data, the surveying instrument is calibrated, taking into account an optical property of the camera (see also table II).

- 2.2. The subject-matter of claims 1 and 2 differs from this method mainly in that for the

calibration, the relative orientation of the vertical axis and the tilting axis (tilting-axis error) or the orientation of the camera relative to one of the base element, the vertical axis and the tilting axis is taken into account.

- 2.3. With these measures, calibration errors can be kept low even with a high tilting-axis error or collimation error.
- 2.4. Modifying the closest prior art such as to arrive at the subject-matter of claims 1 or 2 was not obvious because including compensation for tilting-axis errors or collimation errors in the claimed way is neither disclosed nor indicated in any calibrating method described in the prior cited in the International Search Report.

Therefore, the subject-matter of claims 1 and 2 is considered new and inventive within the meaning of Articles 33(2) and 33(3) PCT.

3. Since claims 3 to 26 all include the above features as well, their subject-matter is considered to be new and inventive within the meaning of Articles 33(2) and 33(3) PCT, too.
4. The subject-matter of claim 27 is not considered to be new in the sense of Article 33(2) PCT for the following reasons:

Claim 27 is directed to a surveying instrument comprising a base element and a camera with an image sensor, the camera being rotatable about a vertical axis fixed with respect to said base element and being rotatable about a tilting axis, the tilting axis being rotated about the vertical axis with rotation of the camera about the vertical axis.

Such a surveying instrument is known in the prior art, cf. e.g. section IV.2.2 above.

The subject matter of claim 27 is further characterised in that "the survey instrument being calibrated using a method according to any of claims 1 to 19".

Yet, this feature defines merely the use to which the instrument is to be put; as this use does not imply unambiguously a well-defined structure or function of the instrument, claim 27 is not clear (Article 6 PCT; see also the PCT Guidelines 5.37).

As it is considered that with appropriate data processing, the phototheodolite described in D1 is suitable for being calibrated according to the method of claim 1, the subject-matter of claim 27 is not considered as new.

5. The subject-matter of claims 1 to 27 meets the requirements of Article 33(4) PCT with respect to industrial applicability (see also the PCT Guidelines 14.01).
6. Note: Concerning further deficiencies falling under the sections II, VI, VII or VIII, no information will be given in the International Preliminary Examination Report (see the Official Journal 11/2001, page 542, section V, point 13: "Further rationalisation measures").